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ABSTRACT

The effectiveness of electromyographic (EMG) biofeedback/relaxation training on the stress management and anxiety levels of 18 eighth-grade students was tested. Chapter I serves as an introduction and presents information on the need for the study, hypotheses, limitations, and definition of terms. Chapter II contains a review of related literature. The third chapter describes the research methods used. Pre- and post-test instruments were a stress management inventory and the State-Trait Inventory to measure stress and anxiety, and Cyborg BL 900 and EMG J33 instruments measured forehead muscle tension. Experimental group students participated in four 50-minute EMG training sessions in which they were taught muscle relaxation exercises through instrumentation that detects and immediately feeds back continuous electronic signals representing changes in muscle tension. The control group was given the same treatment time without EMG training. Chapters IV and V contain results and discussion, summary, conclusions, and recommendations. Results showed that, although stress management behavior was enhanced and anxiety level and muscle tension decreased, differences between the control and experimental groups were not statistically significant. Since research literature points to successful use of EMG training for decreasing muscle tension, it is recommended that future studies increase treatment sessions and relaxation exercises and redesign the test to accommodate a third control group and off-site practice sessions. Appendixes contain various materials used in or for the study. (FG)

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STRESS MANAGEMENT AND ANXIETY REDUCTION THROUGH EMG BIOFEEDBACK/RELAXATION TRAINING UPON JUNIOR HIGH STUDENTS

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The purpose of this study was to determine the effectiveness of electromyographic biofeedback/relaxation training on the stress management and anxiety levels of junior high students. The subjects (N = 18) in this study were male and female eighth grade students at La Crescent Junior-Senior High School, La Crescent, Minnesota. The Stress Management Inventory was developed by the researcher to determine stress management in eighth grade students. The inventory was validated by a group of six jurors and reliability was determined by Hoyt's Analysis of Variance. Anxiety levels were determined using the State-Trait Anxiety Inventory. This study called for a pretest-posttest experimental design. To determine significance of stress management and anxiety change, the Mann-Whitney U-test was utilized. Differences in muscle tension were tested for significance with a t-test. Statistical analysis of data revealed no significant differences between groups at the .05 level of significance, although there was some observable change in muscle tension, anxiety, and stress management in the expected direction.

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CHAPTER 1

INTRODUCTION

In the United States today, there are certain factors in Americans' lifestyles that contribute to many personal health problems. The "Big Three" health problems are cancer, coronary heart disease, and stroke. In 1978, Williamson stated that there is evidence that the combination of inadequate nutrition, lack of physical exercise, cigarette smoking, and poor stress management may contribute to these three health problems.

Data accumulated over the last 100 years has shown a shift in disease patterns from infectious to stress-related disease processes (Germeroth, 1978). Researchers have established a specific relationship between stress arousal and dysfunction of various body systems (Benswanger, 1977). In a 1979 presentation, Chen stated that further investigations have shown that a relationship exists between physiological reaction to stress arousal and dysfunction of various organ systems. The increase in stress arousal causes changes in the organ systems, usually in the form of hyperactivity of the body's autonomic and endocrine system, which could contribute to the development of cardiovascular disease and other degenerative diseases.

In addition to stress arousal, anxiety can be a contributing factor in one's physical and emotional deterioration. People experience anxiety differently. Described as fear, discomfort, uneasiness, guilt, apprehension, or remorse, anxiety is produced by real or unreal

situations. Anxiety can lead to physical discomfort caused by muscular tension, gastrointestinal distress, headache, or excessive perspiration.

Stress and anxiety are potential difficulties for the early adolescent. Some of the factors contributing to stress and anxiety are physical maturation, peer pressure, social acceptability and low self-esteem. In addition to these, there may be unusual pressures such as death of parent, severed relationships, academic failure, unwanted pregnancy, substance dependency, and psychological or physiological abnormalities. Considering all these factors, it is apparent that young adolescents might benefit from instruction in stress management and anxiety reduction.

Electromographic (EMG) biofeedback/relaxation training has been shown to be an effective treatment in controlling the autonomic nervous system (Budzynski, Stoyva, and Adler, 1972). By learning voluntary control over the autonomic nervous system, an individual can establish reliable techniques and methods for the control of muscle tension and ultimately, stress and anxiety.

Treatment of health problems has been in the past the traditional route taken by the health-related professionals. Today, however, more emphasis is being placed on the prevention and elimination of factors which contribute to personal health problems. This emphasis is toward the goal of a healthy lifestyle. Ardell (1977) views this pursuit as wellness. According to Ardell (1977), wellness is a concept in which people educate themselves to an understanding of their basic emotional and physical needs, and learn how to meet those needs.

Wellness is composed of five dimensions: (1) self-responsibility, (2) nutritional awareness, (3) stress management, (4) environmental sensitivity, and (5) physical fitness (Ardell, 1977). Effective stress management techniques may aid an individual in attaining high level wellness.

Need for the Study

There is beginning to be a great amount of research on the effects of Electromyographic (EMG) biofeedback/relaxation training upon stress management (Germeroth, 1978). Little or no study of EMG biofeedback/relaxation training on junior high students has been conducted. Early adolescents are faced with excessive anxiety and stressful situations in the educational setting (Nijhawan, 1972). Research of this age group is needed to see if EMG biofeedback/relaxation training can be successfully utilized to lower anxiety and affect their behavior towards stress management.

Statement of the Problem

The purpose of this research was to investigate the effectiveness of Electromyographic (EMG) biofeedback/relaxation training on the frontalis muscle in reducing anxiety levels and developing more positive behavior of junior high students towards stress management as a dimension of wellness.

More specifically the purpose of this research was to:

(1) Determine if subjects who receive EMG biofeedback/relaxation training of the frontalis muscle exhibit a decrease in muscle tension.

(2) Determine the effectiveness of EMG biofeedback/relaxation training on reducing anxiety of junior high students, using the State-Trait Anxiety Inventory (Spielberger, 1966).

(3) Determine the effectiveness of EMG biofeedback/relaxation training on the behaviors of junior high students toward stress management, using the revised stress management section of the Beier Wellness Behavior Inventory (Beier, 1979).

Hypotheses

(1) There is no significant difference in the decrease of muscle tension between those subjects who receive EMG biofeedback/relaxation training and those subjects who do not receive training after the experimental treatment.

(2) There is no significant difference between anxiety levels of those who receive EMG biofeedback/relaxation training and those subjects who do not receive training before and after the experimental treatment.

(3) There is no significant difference in the behavior of junior high students towards stress management between those subjects who receive EMG biofeedback/relaxation training and those subjects who do not receive training before and after the experimental treatment.

Limitations

The research involved the following limitations:

(1) The sample size for experimental and control groups was restricted due to the availability for junior high students at La Crescent Junior-Senior High School, La Crescent, Minnesota, and the number of subjects that the investigator could work with effectively (N = 10

students for experimental group; N = 10 for control group).

(2) The possibility of social interaction between experimental and control group subjects could not be controlled.

(3) Data was derived from a population situated in La Crescent, Minnesota, which limits generalizations derived from the researcher's findings to this population.

Definition of Terms

The following terms have been defined to clarify their use in the study:

Anxiety: An unpleasant emotional state consisting of subjective feelings of tension, apprehension, and worry, and heightened autonomic nervous system activity (Spielberger, 1966).

Anxiety level: The mesaurement of anxiety through the State-Trait Anxiety Inventory (Spielberger, 1966).

Autogenic relaxation: A combination of self-suggestion phrases for learning to control tension.

Electromyographic (EMG) Biofeedback/Relaxation Training: A training procedure for teaching muscle relaxation through the use of instrumentation to first detect, then feed back to the individual, immediate and continuous electrical signals which represent changes in muscle tension.

Muscle relaxation: The reduction of muscle tension measured in microvolts per second.

Muscle tension: Muscular contraction of the forehead (frontalis) muscle which is measured in microvolts per second.

State-Trait Anxiety Inventory: An instrument containing 40 statements

used to measure anxiety level (Spielberger, 1966).

Stress: The non-specific physio-psychological response of the body to any demand made upon it. The intensity of the demand for readjustment of adaptation is a primary concern, but it is not something to necessarily avoid (Selye, 1974).

Stress Management: The controlling of nervous strain, so the individual can properly function in daily life.

Stress Management Behavior: A dimension of wellness measured by Stress Management Behavior Inventory developed for the research.

Wellness: An integrated method of functioning which is oriented toward maximizing the potential of which the individual is capable. It requires that the individual maintain a continuum of balance and purposeful direction within the environment where he/she is functioning (Dunn, 1961).

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of the literature revealed a lack of information pertaining to the effectiveness of Electromyographic (EMG) biofeedback/ relaxation training upon the anxiety levels and behavior toward stress management of the early adolescent age group.

The review of the literature is subdivided in the following manner:

1. Wellness
2. Stress and Implications on Education
3. Stress Management
4. Electromyographic (EMG) Biofeedback
5. Relaxation Training
6. Summary

Wellness

In recent years, the term wellness has become part of the lay person, as well as health professionals. However, each person if questioned would probably develop a different definition of wellness. To some people, wellness is nothing more than having good physical health. Wellness is more than physical health. It is a concept. A concept in helping people become experts about themselves. Wellness is also a process by which people take charge of their lives, and feel good about themselves. People interested in wellness are viewing it as a lifestyle, a value and a way of growing. The concept of wellness

is not new. In 1961, Halbert L. Dunn described wellness as:

> An integrated method of functioning which is oriented toward maximizing the potential of which the individual is capable. It requires that the individual maintain a continuum of balance and purposeful direction within the environment where he is functioning (p. 4,5).

Since 1961, many other individuals have provided definitions of the concept of wellness. Bruhn and Cordova, et. al. (1977) defined wellness as:

> Wellness is not a static state of being. Rather it is a continually evolving and changing process in which individuals may participate...an integration of all aspects of their physical, mental, social and environmental wellbeing (p. 209).

Another definition of wellness offered by John Travis, founder of the Wellness Resource Center in Mill Valley, California is:

> ...giving care to the physical self, using the mind constructively, channeling stress energies positively, expressing emotions effectively, becoming creatively involved with others, and staying in touch with the environment (Ardell, 1977, p. 10).

Don Ardell (1977), a pioneer in wellness, has recently received much exposure through the text he wrote entitled, High Level Wellness. Ardell (1977) states that each person is responsible for their own well-being. Taking responsibility for our own health is a big part of wellness. Without self-responsibility, a person lacks the necessary motivation leading to a healthy lifestyle. Ardell (1977) describes wellness in five dimensions: (1) self-responsibility, (2) nutritional awareness, (3) stress management, (4) physical fitness and (5) environmental sensitivity. Each of the five dimensions are fundamental to a complete wellness lifestyle.

Prevention is a key concept in wellness and therefore it can be reasoned that the earlier a person can be exposed to the wellness concept,

the greater the opportunity to develop high level wellness. A large percentage of students are experiencing physical and mental health problems (Engelhardt, 1975). Studies have shown that a majority of these problems could be labeled anxiety, nervousness, tension, or stress (Engelhardt, 1975). At an early educational age, this stress can cause inability to concentrate and can lead to general anxiety states (Nijhawan, 1972). This stress can also lead to a variety of psychosomatic illnesses such as, ulcers, tension headaches, and migraine headaches (Severson, 1976). Stress management needs to be emphasized as early as possible in the educational ladder, in order to squelch the frustrations that can compound into developing poor self-esteem and self-confidence. If stress is not properly managed, a person may have difficulty functioning in society. Pilch (1978) believes a person must understand and appreciate life's joys and pleasures, in order to attain high levels of wellness. Lack of stress management skills prevents a person from understanding and appreciating life's joys and pleasures.

Stress and Implications on Education

> Epidemiological data for western countries show that disease patterns have shifted remarkably over the past century and a half; in essence a change from communicable diseases to stress related and degenerative disorders (Germeroth, p. 36).

Many of today's school children and adults are experiencing all forms of stress. The failure of management of this stress is often resulting in ulcers, hypertension, nervous twitches, headaches, insomnia, cardiac problems, fatigue, and premature aging (Engelhardt, 1975). If these conditions are not dealt with, they can and often lead to early death (Germeroth, 1978).

Due to the lack of knowledge and skill in stress management, approximately two million school age children in the United States are taking amphetamines to counteract the effects of stress and tension in their lives (Engelhardt, 1975). The stressful student is observed biting nails, stuttering, 'clutching' on exams, having poor concentration and short attention span, frequent illnesses, and abusing substances that are not conducive to personal health. The lifestyle of the student has a definite effect on their ability to cope in the world. The physical abuses extended upon their bodies often leads to stress and its implications. The uptight student abuses everything from aspirin to alcohol. The eating of highly sugared "junk" food leads to hyperactivity, only compounding the stress (Gaudry and Spielberger, 1971). This inability to manage stress causes the student to revert to behaviors learned earlier that seemed to help them deal with the stress. This poor stress management, or poor coping behavior, is in direct conflict with the concept of wellness.

The stress response brings about the "fight or flight" mechanism. This condition brings about tension and/or anxiety. If a child is faced with this problem, the various systems of the body react, causing high internal activity and usually accompanied by generalized muscle tension (Carter, 1978). Benson (1975) describes this muscular tension-anxiety relationship quite clearly by saying, if a child lets this tension further develop into the fear of failure, this fear can become psycho-physiologically stressful. Constant tension and stress contribute to anxiety in individuals. Students who experience these stressors have great difficulty in the educational process, because they are unmindful of details, unsure of themselves and tend to be less satisfied with

life (Engelhardt, 1975).

Stress Management

There is beginning to be a great deal of interest in educating students and adults in methods that will help them manage the stresses in their lives. The inability to deal effectively with stress elicits coping behaviors, recognizing as self-destructive and illness causing (Germeroth, 1978). People must be able to deal with the stresses and strains of daily living.

The most desirable approach to stress management would be one which teaches active coping skills that are designed to deal with anxiety, as well as behaviors that are designed to control the increase in anxiety (Severson, 1976).

Two approaches which have been successful in helping alleviate anxiety are biofeedback training and systematic relaxation training (Brown, 1977). Both of these approaches are designed so the individual can learn to voluntarily regulate his mental and emotional reactions, which ultimately effect his physiological processes.

In 1923 Schultz used autogenic training to treat stress-related diseases. Jacobson (1938) taught progressive muscle relaxation to many individuals. This muscular relaxation helped to alleviate stress and anxiety. However, this relaxation training is not a dramatic new breakthrough. For over 3,000 years the religious philosophies of the Hindu-Yogi and the Zen-Buddhists have claimed self-control over bodily functions (Rohm and Goyer, 1977). These Yogi and Zen masters have used various physical, psychological, spiritual and meditative methods to achieve

control (Bagchi, 1969; Lesh, 1971). Trancendental Meditation, more commonly known as TM, has emerged as a modern version of yoga (Maharishi Mahesh Yogi, 1969).

Once a person can become aware of the tension and how to release that tension and anxiety, he can function in the world in a more "relaxed" state.

Electromyographic (EMG) Biofeedback

Electromyographic (EMG) biofeedback is the utilization of electrophysiological instruments that monitor changes in muscle tension and then feed back immediate and continuous electrical signals which represent this biological activity. This process helps a person learn self-control over specific bodily functions such as heart rate, blood pressure, muscle tension and others that were once thought to be involuntary (Coursey, 1975). Electromyographic biofeedback training, combined with relaxation training, gives an individual the ability to become aware of information about the body's biological functioning, and then learn to control that functioning. Skinner's Operant Conditioning Principles illustrated the first successful uses of EMG biofeedback on animals and man (Rohm and Goyer, 1977). EMG biofeedback/relaxation training is becoming recognized as a successful tool in controlling mind-body functions and as a therapeutic technique (Gaarder, 1976).

It should be stated that EMG biofeedback is not a 'cure-all'. In a presentation by Chen (1979) it was stated that EMG biofeedback/relaxation training is a way for individuals to become aware of the tension and anxiety in the body. A person has to realize that the body and mind are

interdependent upon each other and cannot be separated. Thoughts can accumulate as tension and anxiety, causing pain or discomfort in the body.

The rationale of the EMG biofeedback/relaxation training involves the idea that learning is most effective when the student is physically and mentally relaxed. Once this relaxation can be achieved, feedback can be received and the individual can perceive which thoughts cause the increase in muscle tension.

Baseline readings of the subjects have to be established before any training can occur. The rationale for the baseline readings is so the investigator knows where the subject's muscle tension level is registered prior to the treatment. Once this has been established, instructions can then be given to the subject. The subject can then 'tune into' the body and the muscle tension that is monitored by the EMG instruments.

Relaxation Training

Relaxation has many definitions and each person has individual interpretations about what relaxation means. The teaching of relaxation training is not a new development. The ancient Yogi and Zen Buddhists have taught self-control over the body and the bodily functions (Rohm and Goyer, 1977). The modern version of yoga has emerged under the label of Trancendental Meditation (Rohm and Goyer, 1977). Meditation is one form of relaxation training which has been helpful in reducing stress (Rohm and Goyer, 1977).

In 1929 Jacobson first outlined the technique of "Progressive Relaxation". Jacobson was one of the first to recognize that many human disease states were related to neuromuscular hypertension (Allen, 1976). Therefore, if tension can be relieved, disease prevalence may be reduced.

According to Lader and Matthews (1971) perhaps the most widely accepted form of general relaxation training is Jacobson's "progressive relaxation". This technique is exactly what the name implies. It is progressive, one step at a time, method designed to relieve virtually all sense of tension in the voluntary muscles of the body. "Progressive relaxation" is a progressive series of tension and release intervals. A subject begins progressive relaxation by finding a fairly quiet room. A comfortable position is found. The best position is flat on the back. This position will eliminate strain or tension in other parts of the body (Jacobson, 1938). A subject begins progressive relaxation by shifting his awareness to his feet. The subject then contracts all the muscles in both feet, in order to become aware of tension sensations. The tension is then released and the person becomes aware of the sensations of relaxation, or the absence of tension. This procedure is then repeated for the muscles of the lower leg. The relaxing individual progresses up the body to the upper thigh, continuing the tension-release cycle. The next area of attention is the trunk. The abdominal and chest muscles are contracted and released. Attention needs to be focused on the breathing process, for progressive relaxation should not control the breathing process. The relaxing individual progresses up the body to the shoulders and neck, continuing to repeat the tension-release cycle. According to Nicassio and Bootzin (1974) the typical interval time used in progressive relaxation is approximately 50 seconds, allowing five seconds of tension and 45 seconds for the tension release.

Another technique of general relaxation of the body has been described by Herbert Benson (1975). The technique is called the "Relaxation

Response" and has been developed from a combination of "Eastern and Western religious, cultic, and lay practices" of meditation (Benson, p. 159). Benson (1975) states the four basic components of the "Relaxation Response" are:

> (1) A Quiet Environment: The environment should be calm and quiet with few distractions. This environment will aid in the effectiveness of relaxation.
>
> (2) Mental Device: The relaxing individual needs to repeat a sound, word, or phrase to shift the mind to a more relaxed state and counteract distracting thoughts.
>
> (3) A Passive Attitude: The passive attitude is perhaps the most important aspect of the Relaxation Response. The individual should not worry about wandering thoughts, and adopt a "let it happen attitude".
>
> (4) A Comfortable Position: The relaxing individual needs to adopt a comfortable position so no undue tension occurs in other parts of the body. The position should be both comfortable and relaxing.
>
> (Benson, 1975, p. 160)

The individual should sit quietly in a comfortable position, close his eyes, deeply relax all muscles, breathe through the nose and become aware of breathing. As the individual breathes out, he says the word, "One" silently to himself. Continue for approximately 20 minutes and try to practice twice daily (Benson, 1975).

Autogenic relaxation is another form of relaxation that has been shown to be effective in helping individuals overcome stress (Brown, 1977). The autogenic method was developed in the early 1920's by J.H. Schultz (Jencks, 1973). Autogenic relaxation is a combination of self-suggestion phrases about relaxation and self-suggestion phrases for learning to control consciousness. It is known that the process of autogenic

relaxation is only effective if the individual follows a disciplined procedure of practice over a long period of time (Niccasio and Bootzin, 1974).

Jencks (1973) describes Schultz's Autogenic Training procedure as follows:

> Exercises are practiced three times daily. During each practice session the sequence of formulas and ending the hypnotic state is repeated three times. The standard formulas are repeated only after the trainee is in his training posture, has closed his eyes and, if desired, done his preliminary relaxation. Each formula should be repeated 4-7 times. Heaviness alone is practiced for at least one week; then the other five formulas are added at approximately weekly intervals.
>
> A minimum of six weeks should be allowed for learning the six standard exercises.
>
> The Standard Formulas
>
> 1. Heaviness: "My right arm is comfortably heavy." If, with practice, the feeling of heaviness in the right arm is achieved regularly, becomes more pronounced, and generalizes to other limbs, the formula is extended to include the other limbs; "My left arm..., both arms..., my right leg, my left leg..., both leg..., arms and legs..."
>
> 2. Warmth: "My right arm is comfortably warm." The same progressive procedure as with heaviness is used for the warmth formula.
>
> 3. Heartbeat: "Heartbeat calm and regular," or just passively observing the heartbeat.
>
> 4. Respiration: "Respiration regular -- it breathes me," or passively observing the breathing rhythm.
>
> 5. Internal Warmth: "Solar plexus comfortably warm."
>
> 6. Cooling of the Forehead: "Forehead pleasantly cool."
>
> After the standard formulas have been repeated 4-7 times in the sequence given, the hypnotic state is ended in a manner similar to awakening after a deep sleep. For this the trainee tells himself and acts out.
>
> "Flex and stretch arms! Inhale or yawn deeply! Open eyes!" (Jencks, 1973, p. 30-31).

Summary

Stress and stress related problems are increasing daily in our American society. People are finding effective positive coping procedures to use in combating stress. Biofeedback and relaxation training work very effectively in helping people to alleviate the effects of stress. The use of EMG biofeedback supplemented by Jacobson's, or Benson's, or autogenic relaxation has been shown to effectively help people to counteract the effects of stress (Gaarder, 1976).

Effective stress management is one of the five dimensions of wellness (Ardell, 1977). Having stress management consciousness and skills will take a person a long way towards high level wellness!

CHAPTER III

METHODS

The purpose of the research was to investigate the effectiveness of Electromyographic (EMG) biofeedback/relaxation training in reducing anxiety levels and developing more positive behavior of junior high students toward stress management. This chapter is divided into the following sections:

1. Subject Selection
2. Experimental Design and Procedures
3. Instrumentation
   a. Measurement of Muscle Tension
   b. Stress Management Behavior Inventory
   c. State-Trait Anxiety Inventory
4. Analysis of Data
5. Summary

Subject Selection

The sample for this research was 20 randomly selected students from a volunteer group of eighth grade students at La Crescent Junior-Senior High School, La Crescent, Minnesota. The subjects were selected from two physical education study halls. The subjects were randomly assigned into experimental (N = 10) and control (N = 10) groups according to their physical education study hall. A letter of explanation was sent to parents and all subjects completed consent forms for human subjects (Appendix A-1 and A-2). 18

Experimental Design and Procedures

Procedure. All subjects were pretested on the first day of the research using the State-Trait Anxiety Inventory (Spielberger, 1966) as a test for anxiety and the Stress Management Behavior Inventory developed for the research.

All subject's baseline readings of muscle tension were measured with a Cyborg EMG J33 and BL 900 Processor instrument (Cyborg, 1976).

The subjects' muscle tension were pretested between the second and fifth day of the first week of the research. Testing was done in a room darkened by subdued lighting with the subject resting in a comfortable chair. The frontalis muscle was used to measure muscle tension. The baseline reading was recorded after the subject relaxed for 5 consecutive minutes on his own. After the initial relaxation period of 5 minutes, the subject's tension level was recorded every minute for a period of 5 minutes using the BL 900 Processor (Cyborg, 1976). The mean score in microvolts was used to determine subject's baseline EMG readings.

The subjects were posttested between the first and fifth days of the fifth week of the study using the State-Trait Anxiety Inventory (Spielberger, 1966) and the Stress Management Behavior Inventory developed for the research. Posttest resting EMG readings were also conducted during this time frame.

Treatment. Experimental subjects were scheduled for one 50-minute session per week and had to complete three training sessions to be included in the study (Chen, 1979). The first session consisted of introduction and explanation of EMG biofeedback/relaxation training. The following protocol suggested by Chen (1979) was read aloud to the subject while the subject read

silently:

The goal of EMG biofeedback training is to learn to relax your forehead muscle. The machine to which you are connected will feed back to you information regarding the amount of tension in your forehead muscle. The feedback that you will receive will be in the form of an audio signal. The audio signal will respond with a signal proportional to the tension within your forehead muscles.

Feedback signal:

Audio tone: As tension increases the click rate will increase. Your goal will be to identify those thoughts and/or feelings that will slow the click rate. Try to avoid those thoughts or feelings that speed up the click rate. Do no try too hard or worry about failure because these responses will only make you more tense and thus defeat your goal of deep relaxation.

To learn the relationship between changes in muscle tension and the feedback you will receive, do the following exercises first:

1. Raise eyebrows.....then.....relax.

2. Frown.....then.....relax.

3. Squeeze eyes shut.....then.....relax.

4. Clench your teeth.....then.....relax.

During the rest period it is suggested that you try to recall the feelings and thoughts that were related to feedback indicating a decrease in muscle tension.

The second training session consisted of 10 minutes of instruction and practice using the first formula of Standard Autogenic Relaxation (Jencks, 1973) exercises, followed by 10 minutes of EMG biofeedback training by each of the subjects. The subjects were grouped together in pairs to aid each other in the regulation of the EMG instruments.

The third and fourth training session consisted of the same protocol as the previous session.

The control group was given the exact same time span as the experimental group; 50 minutes. There was no training of biofeedback

or relaxation given to the control group. Their time was spent watching three different movies concerning nutrition, while being connected to non-functioning EMG J33 instruments.

The fifth session was used to collect posttest data using the State-Trait Anxiety Inventory (Spielberger, 1966) as a test for anxiety and the Stress Management Behavior Inventory as a test for stress management. Posttest resting EMG readings were also conducted during this session.

Instrumentation

Measurement of Muscle Tension. Muscle tension of the frontalis muscle was measured with a Cyborg BL 900 EMG biofeedback instrument (Cyborg, 1976). The Cyborg BL 900 meets the requirements of both physical therapy and psychology/psychiatry (Cyborg, 1976). It measures EMG activity in the range 0.7-1000 microvolts/second and is equipped with cup sensors. The investigator recorded readings of feedback using a Cyborg BL 900 Processor. The subject's skin was prepared by cleaning it with alcohol. The skin was abraded and the sensors were placed in the midline of the forehead. Approximately one-half inch of Redux Paste (Hewlett Packard) was placed on the electrodes to insure conductivity.

Stress Management Behavior Inventory. Through the review of literature, it was discovered that no stress management inventory existed that was appropriate for the eighth-grade population. The goals of the research demanded an instrument to measure stress management.behavior of eighth grade students. Upon receiving written permission (Appendix B-1 and B-2) to utilize the Beier Wellness Behavior Inventory, statements regarding stress management were revised by the researcher. An inventory was constructed consisting of 15 statements. The statements were revised based upon review

of the Beier Wellness Behavior Inventory (1979) which included stress management as a dimension of wellness.

To assure the readability of the statements as well as the content validity, a six-member jury was selected to evaluate and revise the 15 statements. Jury selection was based upon the awareness of persons known to be knowledgeable in the areas of stress management and inventory development. Jurors consisted of five faculty members from the Health Education Department at the University of Wisconsin - La Crosse. Of those five jurors, one was serving as the stress control consultant to the United States Ski Team, another had done previous research in stress management, another was the developer of the Beier Wellness Behavior Inventory, another co-authored a text entitled, How to Relax: A Wholistic Approach, and the fifth from the Health Education Department was an expert in the area of inventory development. The sixth juror was the director of the biofeedback laboratory at the Counseling and Testing Center at the University of Wisconsin - La Crosse.

Initial contact requesting each individual's assistance in evaluation of the inventory was made by mail. A cover letter included an explanation of the study (Appendix C-1) and a copy of the proposed inventory statements with an evaluation form also included (Appendix C-2). The evaluation form, developed by Gilmore (1974), enabled jurors to respond to each of the statements indicating a subject's behavior (positive or negative) in regards to stress management. A numerical rating system from 1 (not acceptable) to 5 (indispensable) was utilized to evaluate each statement. Evaluation consisted of calculation of the mean score for each statement. Inventory evaluation results are found in Appendix C-3. Statements with a mean score of 3.0 or above were accepted for inclusion in the inventory. Written comments by jurors aided in the format for

the inventory. The completed Stress Management Behavior Inventory can be found in Appendix D.

Subjects selected from eighth grade students attending La Crescent Junior-Senior High School were instructed to respond to each statement on a three-point scale of participation from "Always True", "Usually True", to "Never True". Statements were given a numerical weight as follows: Always True = 5; Usually True = 3; Never True = 1. Total score values were calculated by summing the values from each statement response with 75 being the highest possible score.

Reliability of the inventory was determined by pretesting a group (N = 26) of eighth grade health students from Onalaska Junior High School, Onalaska, Wisconsin. Hoyt's Analysis of Variance was used to calculate the reliability coefficient. Calculation resulted in a reliability coefficient of .55171. As described in Borg (1971, p. 359), correlations ranging from .35 to .65 are significant beyond the one percent level. Correlations around .50 indicate crude group predictions may be achieved. As the instrument is used more often, the reliability coefficient should rise. Values for the statistical analysis are found in Appendix E.

State-Trait Anxiety Inventory. The State-Trait Anxiety Inventory (Spielberger, 1966) is comprised of separate self-report scales for measuring two distinct anxiety concepts: state anxiety (A-State) and Trait anxiety (A-Trait). The STAI has been found to be useful in the measurement of anxiety in junior and senior high school students (Spielberger, 1970). The STAI A-Trait scale consists of 20 statements that ask people to describe how they generally feel and the A-State scale

consists of 20 statements that ask subjects to respond how they feel at the time of administering the inventory (Appendix F).

Statistical Analysis of Data

Selection of Tests. Non-parametric statistical tests were chosen for analysis of data of the Stress Management Behavior Inventory and the State-Trait Anxiety Inventory. According to Blalock (1970):

> We would expect to find that non-parametric alternatives to the difference-of-means test will be most useful whenever either of two conditions is met: (1) we cannot legitimately use an interval data but ordering of scores is justified, or (2) the sample is small and normality cannot be assumed (p. 244).

The level of data collected is ordinal and the study population was relatively small (N = 20). Thus, the above criteria for use of non-parametric statistics was met. In order to study the effectiveness of EMG biofeedback/relaxation training on stress management and anxiety reduction, the following test was made:

(1) The Mann-Whitney U-test was used to compare the difference between experimental and control group pretest scores on the Stress Management Behavior Inventory.

(2) The Mann-Whitney U-test was used to compare the differences between experimental and control group change scores on the Stress Management Behavior Inventory.

(3) The Mann-Whitney U-test was used to compare the differences between experimental and control group pretest state anxiety scores using the State-Trait Anxiety Inventory.

(4) The Mann-Whitney U-test was used to compare the differences between experimental and control group state anxiety change scores using the State-Trait Anxiety Inventory.

(5) The Mann-Whitney U-test was used to compare the differences between experimental and control group pretest trait anxiety scores using the State-Trait Anxiety Inventory.

(6) The Mann-Whitney U-test was used to compare the differences between the experimental and control group trait anxiety change scores using the State-Trait Anxiety Inventory.

EMG biofeedback utilizes interval data, so in order to study the effectiveness of EMG biofeedback/relaxation training on muscle relaxation, the following test was made:

(1) The t-test was used to compare pretest baseline means on EMG measurements between experimental and control groups.

(2) The t-test was used to compare change score baseline means on EMG measurements between experimental and control groups.

All analyses were tested at the .05 level of significance.

Summary

A Stress Management Behavior Inventory and State-Trait Anxiety Inventory were used to measure changes in behavior after practice of a series of relaxation training. Muscle tension was measured prior to and after training sessions. Experimental and control group subjects were selected from eighth graders attending La Crescent Junior-Senior High School, La Crescent, Minnesota. A pretest-posttest design was utilized to assess effectiveness of the biofeedback/relaxation program on stress management and anxiety. The Mann-Whitney U-test was used for analysis of data concerning stress management and anxiety. A t-test was utilized to determine the significance in change of muscle tension.

CHAPTER IV

RESULTS AND DISCUSSION

The research was conducted to investigate the effectiveness of EMG biofeedback/relaxation training on muscle relaxation, stress management, and anxiety reduction. Differences between the experimental and control groups in terms of muscle relaxation were tested using the t-test. The Mann-Whitney U-test was used to compare differences in stress management and anxiety reduction between experimental and control groups. The results and discussion are presented in this chapter.

Effectiveness of EMG biofeedback/relaxation training on stress management behavior.

Pretest Stress Management. All subjects were pretested for stress management behavior prior to the training phase of the research. Table 1 presents the pretest ranking of the experimental and control group analyzed by the Mann-Whitney U-test. These data were analyzed in an attempt to identify any significant difference betweenthe two groups prior to testing. The results of the comparisons indicated that there were no significant differences ($p<.05$) between the two groups.

Training Effect. To examine the training effect between the two groups, a change score was calculated for each subject by subtracting the posttest Stress Management Inventory score from the pretest Stress Management Inventory score. Table 2 presents the change score ranking of the experimental and control group analyzed by the Mann-Whitney U-test.

Table 1

Results of Comparison of Pretest
Stress Management Behavior by Mann-Whitney U-test.

Experimental	Rank	Control	Rank
53	4.5	51	7.0
47	11.5	49	9.5
47	11.5	53	4.5
37	18.0	43	14.0
40	16.0	51	7.0
51	7.0	57	2.5
41	15.0	39	17.0
61	1.0	57	2.5
49	9.5	45	13.0
$N_1 = 9$	$R_1 = 94.0$	$N_2 = 9$	$R_2 = 77.0$

U = 32
Crit U ≤ 17

Table 2

Results of Comparison of Change Score Values of
Stress Management Behavior by Mann-Whitney U-test.

Experimental	Rank	Control	Rank
0	12.5	12	1.0
8	5.5	- 2	15.0
8	5.5	4	7.5
10	2.5	0	12.5
9	4.0	- 6	17.5
- 6	17.5	2	9.5
2	9.5	4	7.5
0	12.5	- 4	16.0
0	12.5	10	2.5
$N_1 = 9$	$R_1 = 82.0$	$N_2 = 9$	$R_2 = 89.0$

U = 37
Crit U ≤ 17

These data were analyzed in an attempt to identify any significant difference between the two groups after the training. The results of the comparisons indicated that there was no significant difference ($p<.05$) between the two groups.

Effectiveness of EMG biofeedback/relaxation training on state anxiety.

Pretest State Anxiety. All subjects were pretested for state anxiety prior to the training phase of the study using the State-Trait Anxiety Inventory. Table 3 presents the pretest rankings of the experimental and control group analyzed by the Mann-Whitney U-test. These data were analyzed in an attempt to identify any significant difference between the two groups prior to testing. The results of the comparisons indicated that there were no significant differences ($p<.05$) between the two groups.

Table 3

Comparison of Pretest
State Anxiety by Mann-Whitney U-test.

Experimental	Rank	Control	Rank
38	7.5	47	15.0
28	4.0	42	13.0
39	10.0	44	14.0
53	18.0	40	11.5
51	17.0	34	5.0
40	11.5	25	1.0
48	16.0	38	7.5
27	3.0	38	7.5
38	7.5	26	2.0
$N_1 = 9$	$R_1 = 94.5$	$N_2 = 9$	$R_2 = 76.5$

$U = 31.5$
Crit $U \leq 17$

Training Effect. To examine the training effect between the two groups, a change score was calculated for each subject by subtracting to posttest state anxiety score from the pretest state anxiety score on the State-Trait Anxiety Inventory (Spielberger, 1966). Table 4 presents the change score of the experimental and control group analyzed by the Mann-Whitney U-test. These data were analyzed in an attempt to identify any significant difference between the two groups after training. The results of the comparisons indicated that there was no significant difference ($p<.05$) between the two groups.

Table 4

Comparison of Change Score Values of State Anxiety by Mann-Whitney U-test

Experimental	Rank	Control	Rank
0	13.0	-14	2.0
5	17.0	-13	3.5
- 7	6.5	- 5	9.0
- 7	6.5	- 2	12.0
- 3	11.0	2	15.0
13	18.0	- 4	10.0
-19	1.0	- 6	8.0
3	16.0	-10	5.0
-13	3.5	1	14.0
$N_1 = 9$	$R_1 = 92.5$	$N_2 = 9$	$R_2 = 78.5$

U = 33.5

Crit U ≤ 17

Effectiveness of EMG biofeedback/relaxation training on trait anxiety.

Pretest Trait Anxiety. All subjects were pretested for trait anxiety prior to the training phase of the research using the State-Trait Anxiety Inventory (Spielberger, 1966). Table 5 presents the pretest scores of the experimental and control group analyzed by the Mann-Whitney U-test. These data were analyzed in an attempt to identify any significant difference between the two groups prior to testing. The results of the comparisons indicated that there were no significant differences ($p<.05$) between the two groups.

Table 5

Comparison of Pretest
Trait Anxiety by Mann-Whitney U-test

Experimental	Rank	Control	Rank
46	12.5	36	4.5
40	7.5	50	15.5
38	6.0	46	12.5
52	18.0	43	7.5
47	14.0	40	7.5
50	15.5	31	1.0
42	9.5	51	17.0
34	3.0	33	2.0
42	9.5	36	4.5
$N_1 = 9$	$R_1 = 95.5$	$N_2 = 9$	$R_2 = 75.5$

$U = 30.5$

Crit $U \leq 17$

Training Effect. To examine the training effect between the two groups, a change score was calculated for each subject by subtracting the

posttest trait anxiety score from the pretest trait anxiety score on the State-Trait Anxiety Inventory (Spielberger, 1966). Table 6 presents the change score of the experimental and control group analyzed by the Mann-Whitney U-test. These data were analyzed in an attempt to identify any significant differences between the two groups after the training. The results of the comparisons indicated that there was no significant difference ($p<.05$) between the two groups.

Table 6

Comparison of Change Score Values of Trait Anxiety by Mann-Whitney U-test

Experimental	Rank	Control	Rank
- 3	11.5	- 6	7.5
- 3	11.5	- 6	7.5
- 3	11.5	-12	1.0
- 6	7.5	-10	2.0
- 2	14.0	2	16.0
1	15.0	- 8	3.0
- 3	11.5	- 7	4.5
4	18.0	3	17.0
- 7	4.5	- 6	7.5
$N_1 = 9$	$R_1 = 105.0$	$N_2 = 9$	$R_2 = 66.0$

U = 21

Crit U ≤ 17

Effectiveness of EMG biofeedback/relaxation training on muscle relaxation

Pretest Resting EMG Levels. All subjects were pretested for baseline EMG levels prior to the training phase of the research. Table 7 presents the t-test comparing the resting EMG levels of the experimental and control groups. The t-value indicated there was no significant difference between the two groups.

Table 7

Results of Comparison of Resting EMG Readings For Experimental and Control Groups by t-test

Group	Mean	S.D.
Experimental	3.35	2.77
Control	2.51	.889
Difference	- .84 *	

* t = 1.746 (one tail test, not significant at the .05 level)

Training Effect. To examine the training effect between the two groups, a change score value was calculated for each subject by subtracting the posttest resting EMG level from the pretest resting EMG level. The data in Table 8 indicated that the t-value was not significant enough to reject the null hypothesis at the .05 level.

Table 8

Results of Comparison of Change Score Resting EMG Readings for Experimental and Control Groups by t-test

Group	Mean	S.D.
Experimental	- 0.66	1.993
Control	- 0.14	.690
Difference	- 0.8254 *	

* t = 1,746 (one tail test, not significant at the .05 level)

Discussion

The present study sought to determine whether EMG biofeedback/ relaxation training can be an effective method of muscle relaxation, stress management, and anxiety reduction in junior high students. The results indicated that there was a reduction in muscle tension for subjects in the experimental group, but the difference was not significant. This may be due to the short treatment time interval. The research design called for the experimental group to undergo autogenic relaxation and EMG biofeedback for a total of 50 minutes/week for three weeks. These may not have been long enough to have a significant muscle relaxation effect. Prager-Decker and Decker (1980) have shown a significant reduction in muscle by giving a longer treatment at three times/week for a period of six weeks.

Subjects in the experimental group were relatively relaxed (low EMG readings) at the pretest, thus even though there was only an average of .66 mv/sec. decrease, it may have indicated some success in controlling muscle tension.

A second purpose of this research was to see if EMG biofeedback/ relaxation training would affect stress management behavior of junior high school students. The data showed that the experimental group was able to increase their stress management behavior as a group, but the change was not significant. It was felt that if further studies were conducted on this population, the design could include increased frequency and overall length of training, to include allsix formulas of Schultz's Autogenic Relaxation (Jencks, 1973). Further research could determine whether levels of relaxation, coupled with the EMG biofeedback training

could possibly create significant changes in stress management behavior.

The third purpose of this research was to see if EMG biofeedback/ relaxation training created any significant difference in anxiety reduction between experimental and control groups. The data for pretest and change scores of anxiety show that the control group had lower levels of anxiety, but not significant enough to show a statistical difference. The experimental group may have had anxiety created due to the use of the instruments and for being included in the research. It was felt that overall anxiety may have been reduced by having more training sessions over a longer period of time. Anxiety is often raised by being unfamilar with anything new. The inclusion of students in the research may have raised their anxiety and without having frequent training sessions, they would have little time to learn and master techniques to aid in their anxiety reduction.

The control group subjects within the study spent equal time viewing three films concerning nutrition, while attached to non-functioning EMG biofeedback instruments. This procedure may have caused an unintentional effect on expectations of subjects in the control group. Indeed, the results of the study also showed the control group decreased muscle tension, increased stress management and decreased anxiety. These changes may have indicated the placebo effect is existing in the group, or it could indicate that relaxation can occur if you are not actively trying to create it! In addition, the social interactions between the experimental and control groups may have enabled subjects in the control group to learn how to decrease muscle tension and anxiety, and enhance their stress management behavior.

A third "no contact" control group at a different location may have controlled for those compounding effects; however, this factor is yet to be examined.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

It was the purpose of this research to assess the effectiveness of electromyographic (EMG) biofeedback/relaxation training on the stress management and anxiety reduction of eighth grade students. An inventory, the Stress Management Inventory, was developed for the study. Three null hypotheses were proposed for investigation of the research.

The Stress Management Inventory was developed by the researcher and juried by six professionals knowledgeable on the topic of stress and inventory development. A total of 20 subjects were used in the study. An equal number of subjects (10) participated in the experimental and the control groups. Only nine student's results were used in both the experimental and control groups, due to student withdrawal from the research. The populations of the experimental and control group were matched according to grade level. The Stress Management Inventory and the State-Trait Anxiety Inventory (Spielberger, 1966) were used as instrumentation for measuring stress and anxiety in the research. The Cyborg BL 900 (Cyborg, 1976) was used as instrumentation for determining muscle tension in the research. The experimental design consisted of the administration of two inventories and the measurement of muscle tension of all subjects of the research. Subjects were randomly selected from a group of eighth grade volunteers from La Crescent Junior-Senior High School, La Crescent, Minnesota. The two inventories

were administered as pretests and posttests. A three week interval occurred between pretesting and posttesting. During that time, the experimental group received three 50-minute treatments of a EMG biofeedback/autogenic relaxation program. The control group followed the same time frame as the experimental group, viewing three films concerning nutrition during the time span between pre and posttesting.

Three statistical procedures were used: Hoyt's Analysis of Variance, the Mann-Whitney U-test, and the t-test. The level of statistical significance established for rejection of the null hypotheses was $p < .05$.

Findings

Three null hypotheses were proposed for the research.

Null Hypothesis #1

> There is no significant difference in the decrease of muscle tension between those subjects who receive EMG biofeedback/relaxation training and those subjects who do not receive training.

The null hypothesis was not rejected because the results of the study indicated there was no significant difference in decrease of muscle tension between the experimental and control groups.

Null Hypothesis #2

> There is no significant difference between anxiety levels of those who receive EMG biofeedback/relaxation training and those subjects who do not receive training.

The null hypothesis was not rejected because the results of the study indicated there was no significant difference in decrease of anxiety levels between the experimental and control groups at the .05 level of significance.

Null Hypothesis #3

There is no significant difference in the behavior of junior high students toward stress management between those subjects who receive EMG biofeedback/relaxation training and those who do not receive training.

The null hypothesis was not rejected because the results of the study indicated there was no significant difference in increase of stress management levels at the .05 level of significance.

Conclusions

Based upon the findings of the research, the following conclusions were drawn:

1. The EMG biofeedback/relaxation training program was able to enhance the stress management behavior among a group of eighth grade students at La Crescent Junior-Senior High School, La Crescent, Minnesota, however, the enhancement was not statistically significant.

2. The EMG biofeedback/relaxation training program was able to decrease the anxiety levels among a group of eighth grade students at La Crescent Junior-Senior High School, La Crescent, Minnesota, but the decrease did not reach statistical significance.

3. The EMG biofeedback/relaxation training program was able to decrease muscle tension in a group of eighth grade students at La Crescent Junior-Senior High School, La Crescent, Minnesota, but the decrease did not reach statistical significance.

Recommendations for Further Research

Based upon the findings and conclusions of this research, the following recommendations have been made:

1. The treatment sessions could be increased from once/week to three times/week and the treatment time interval could be increased from three weeks to six weeks.

2. With the increased frequency and time interval of treatment, the relaxation exercises could be extended to include all six formulas of Schultz's Autogenic Relaxation.

3. The time of year may have affected the outcome of the study, so the research could be further extended to include research of this population at different time intervals throughout the school year.

4. The experimental group could have been required to practice relaxation outside the school setting and keep a journal of frequency and duration of each practice, as well as how they felt before and after the relaxation activity.

5. Add a third "no contact" control group that would prevent effects from social interaction with the experimental group.

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APPENDIXES

APPENDIX A

A-1 LETTER TO PARENTS

A-2 INFORMED CONSENT LETTER

APPENDIX A-2

"Informed Consent"

I understand that the purpose of this study is to learn more about reducing stress and anxiety through biofeedback/relaxation training using eighth grade students.

I confirm that my child's participation as a subject is entirely voluntary. No coercion of any kind has been used to obtain my cooperation.

I have been informed of the procedures that will be used in the study and understand what will be required of my child as a subject.

I understand that my child's responses, written or recorded, will remain completely anonymous.

I wish to give my consent for _____,
(Child's Name)
to serve as a subject in this study.

Signed _____
Parent/Guardian

Please return this form to Mr. Blatti by February 15, 1980. Your prompt response is appreciated.

APPENDIX B

B-1 INVENTORY PERMISSION CORRESPONDENCE

B-2 INVENTORY PERMISSION RESPONSE

APPENDIX B-1

January 22, 1980

Ms. Barbara J. Beier
Health Education Department
University of Wisconsin - La Crosse
La Crosse, Wisconsin 54601

Dear Ms. Beier:

I am a graduate student at the University of Wisconsin - La Crosse in the area of Health Education. I am presently involved in research for my Masters Degree thesis. In my research I am attempting to assess stress management behavior among eighth grade students.

As part of my study I have found it necessary to develop an inventory which will enable me to measure behavior characteristics of stress management. In my research I noted your Wellness Inventory and the section that dealt with stress management. I would like to ask your permission to use that section for the development of an inventory that will be suitable for my population that I am studying.

I would very much appreciate your approval.

Thank you for your time and consideration.

Sincerely,

Darrel Lang

APPENDIX B-2

University of Wisconsin - La Crosse

Health Education Department
La Crosse, Wisconsin 54601

203 Mitchell Hall • 608/785-8162

January 31, 1980

Mr. Darrel Lang
Health Education Department
University of Wisconsin - La Crosse
La Crosse, Wisconsin 54601

Dear Darrel:

Please consider this written permission to utilize the stress management section of the Wellness Inventory I developed.

If I can be of further assistance in the development of your inventory to measure behavior characteristics of stress management, please contact me.

Best to you in your research. I would be interested in seeing your results.

Sincerely,

Barbara Beier

Barbara Beier

An Affirmative Action Equal Opportunity Employer

APPENDIX C

C-1 COVER LETTER TO JURORS

C-2 INVENTORY RATING SCALE

C-3 INVENTORY EVALUATION SUMMARY

APPENDIX C-1

January 12, 1980

Dr. John D. Curtis
Department of Health Education
University of Wisconsin - La Crosse
La Crosse, Wisconsin 54601

Dear Dr. Curtis:

I am a graduate student at the University of Wisconsin - La Crosse completing my Masters Degree in Health Education. At the present time I am working on my thesis which is, "Reducing Stress and Anxiety Through Biofeedback/Relaxation Training Using Eighth Grade Students." In order to see if stress management can adequately be measured, an inventory has to be developed and validated.

Enclosed is a copy of my stress management inventory and evaluation procedures for that inventory. Would you please evaluate the inventory and send the evaluation back to me by way of the self-addressed/stamped envelope.

I appreciate the time and effort you have given me in the evaluation of this inventory.

Thank you for your time and consideration.

Sincerely,

Darrel Lang
#223 1370 Lancer Village
La Crescent, MN 55947

APPENDIX C-2

INVENTORY RATING SCALE[1]

Directions: Enclosed is a list of statements regarding stress management behavior. Please read each statement and use the scale to the right to indicate its acceptability, based upon the degree to which the statement will reveal a subject's behavior (positive or negative) in regards to stress management. (Subjects responding to the inventory will be indicating their participation, or non-participation in the statement of stress management.) In this manner you will be judging the curricular validity of these behavior statements with respect to stress management. The inventory has been developed for use with eighth grade students.

The scale values are defined as follows:

1. NOT ACCEPTABLE: The item has no value as a statement for measuring the subject's stress management behavior.

2. SOMEWHAT ACCEPTABLE: The item has some value as a statement for measuring the subject's stress management behavior.

3. ACCEPTABLE: The statement is valuable as a statement for measuring the subject's stress management behavior.

4. VERY ACCEPTABLE: The item is very valuable as a statement for measuring the subject's stress management behavior.

5. INDISPENSABLE: The item is absolutely necessary as a statement for measuring the subject's stress management behavior.

[1] The scale was developed by Dr. Gary Gilmore for use in his doctoral dissertation, The Development, Implementation, and Evaluation of a Family Health Education Program Incorporating the Concept of Prevention, The University of Tennessee, June 1974.

NOT ACCEPTABLE 1	SOMEWHAT ACCEPTABLE 2	ACCEPTABLE 3	VERY ACCEPTABLE 4	INDISPENSABLE 5

	Please Circle Only One	Comment
STRESS MANAGEMENT		
1. At bedtime, I fall asleep easily.	1 2 3 4 5	_____
2. I get 6-8 hours sleep every night.	1 2 3 4 5	_____
3. If I wake up in the middle of the night, it's not difficult for me to fall asleep again.	1 2 3 4 5	_____
4. I bite my fingernails, or tap my foot, or start to perspire when I have pressure placed on me.	1 2 3 4 5	_____
5. I take 15 or 20 minutes a day for myself to do whatever I want.	1 2 3 4 5	_____
6. Rather than worrying about something I can't solve immediately, I go ask for help.	1 2 3 4 5	_____
7. I don't worry about exams when I am well prepared.	1 2 3 4 5	_____
8. I consciously take time each day to relax.	1 2 3 4 5	_____
9. I seldom feel tired (except after strenuous physical activity).	1 2 3 4 5	_____
10. I know that extreme pressure or tension plays a role in causing heart attacks, and I am trying to learn some specific relaxation skills to control my problems.	1 2 3 4 5	_____
11. I am happy with my life when I am able to control my problems.	1 2 3 4 5	_____

NOT ACCEPTABLE 1	SOMEWHAT ACCEPTABLE 2	ACCEPTABLE 3	VERY ACCEPTABLE 4	INDISPENSABLE 5

	Please Circle Only One	Comment
12. I am able to recognize and control some unwanted pressure in my life; such as the way I look, or if I'm being accepted by my friends.	1 2 3 4 5	_____
13. I know how much pressure I can manage and do something to control that pressure.	1 2 3 4 5	_____

APPENDIX C-3

Inventory Statements and Evaluation Score Results

STRESS MANAGEMENT	Rating by Jurors						Mean
	A	B	C	D	E	F	Score
1. At bedtime, I fall asleep easily.	4	5	4	4	3	4	4.0
2. I get 6-8 hours sleep every night.	4	5	3	4	3	4	3.8
3. If I wake up in the middle of the night, it's not difficult for me to fall asleep again.	4	5	4	4	2	4	3.8
4. I bite my fingernails, or tap my foot, or start to perspire when I have pressure placed on me.	3	5	5	3	3	3	3.7
5. I take 15 or 20 minutes a day for myself to do whatever I want.	4	5	4	3	4	4	4.0
6. Rather than worrying about something I can't solve immediately, I do ask for help.	4	5	4	3	2	3	3.5
7. I don't worry about exams when I am well prepared.	4	4	4	3	4	3	3.7
8. I consciously take time each day to relax.	4	5	5	3	4	5	4.3
9. I get tired during the day (except after strenuous physical activity).	3	5	4	2	3	4	3.5
10. I know that extreme pressure or tension plays a role in causing heart attacks, and I am trying to learn some specific relaxation skills to control my problems.	4	5	5	4	4	4	4.3
11. I am happy with my life when I am able to control my problems.	3	5	4	3	3	5	3.8
12. I am able to recognize and control some unwanted pressure in my life; such as the way I look, or if I'm being accepted by my friends.	4	5	3	3	4	4	3.8
13. I know how much pressure I can manage and do something to control that pressure.	4	5	5	3	4	4	4.2

	Rating by Jurors						
	A	B	C	D	E	F	Mean Score
14. I eat more than I should when under pressure.	3	4	4	3	4	2	3.3
15. I lose control, when I get mad.	3	5	4	2	5	2	3.5

APPENDIX D

REVISED

STRESS MANAGEMENT BEHAVIOR INVENTORY

APPENDIX D

STRESS MANAGEMENT BEHAVIOR INVENTORY

Directions: Read the statement and place an "X" under the column which best answers the statement for you.

		Never	Usually	Always
1.	At bedtime, I fall asleep easily.	____	____	____
2.	I get 6-8 hours sleep every night.	____	____	____
3.	If I wake up in the middle of the night, it's not difficult for me to fall asleep again.	____	____	____
4.	I bite my fingernails, or tap my foot, or start to perspire when I cannot handle pressure.	____	____	____
5.	I take 15 or 20 minutes a day for myself to do whatever I want.	____	____	____
6.	Rather than worrying about something I can't solve immediately, I go ask for help.	____	____	____
7.	I don't worry about exams when I am well prepared.	____	____	____
8.	I consciously take time each day to relax.	____	____	____
9.	I get tired during the day (Except after strenuous physical activity).	____	____	____
10.	I know that extreme pressure or tension plays a role in causing heart attacks, and I am trying to learn some specific relaxation skills to control that pressure.	____	____	____
11.	I am happy with my life when I am able to control my problems.	____	____	____
12.	I recognize and know how to handle things that upset me.	____	____	____
13.	I know how much pressure I can manage and do something to control that pressure.	____	____	____
14.	I eat more than I should when under pressure.	____	____	____
15.	I lose control, when I get mad.	____	____	____

APPENDIX E

STATISTICAL PROCEDURES AND RESULTS OF HOYT'S ANALYSIS OF VARIANCE

APPENDIX E

Statistical Procedures and Results of Hoyt's Analysis of Variance

N = No. of persons N = 26
K = No. of test items K = 15

1. Sum of squares between people = 76.92308

2. Sum of squares between items = 113.49744

3. Total sum of squares = 673.18974

4. Residual sum of squares = total sum of squares − sum of squares between people + sum of squares between items

$$482.76923 = 673.18974 - (76.92308 + 113.49744)$$

5. Mean square between people = $\frac{\text{sum of squares between people}}{N-1}$

$$3.07692 = \frac{76.92308}{25}$$

6. Residual mean square = $\frac{\text{residual sum of squares}}{(N-1)\ (K-1)}$

$$1.3794 = \frac{482.76923}{(25)\ (14)}$$

7. Hoyt's Analysis of Variance applied

$$\text{Hoyt's Analysis of Variance Reliability} = \frac{\text{mean square between people} - \text{residual mean square}}{\text{mean square between people}}$$

$$.55171 = \frac{3.07692 - 1.37934}{3.07692}$$

APPENDIX F

STATE-TRAIT ANXIETY INVENTORY

APPENDIX F

State-Trait Anxiety Inventory
Form X-1

Directions: Read each statement and then check the appropriate response to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not At All	Somewhat	Moderately So	Very Much So
1. I feel calm.				
2. I feel secure.				
3. I am tense.				
4. I am regretful.				
5. I feel at ease.				
6. I feel upset.				
7. I am presently worrying over possible misfortunes.				
8. I feel rested.				
9. I feel anxious.				
10. I feel comfortable.				
11. I feel self-confident.				
12. I feel nervous.				
13. I am jittery.				
14. I feel "high struhg".				
15. I am relaxed.				
16. I feel content.				
17. I am worried.				
18. I feel over-excited and "rattled".				
19. I feel joyful.				
20. I feel pleasant.				

APPENDIX F

State-Trait Anxiety Inventory
Form X-2

Directions: Read each statement and then check the appropriate response to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

		Not At All	Somewhat	Moderately So	Very Much So
21.	I feel pleasant.				
22.	I tire quickly.				
23.	I feel like crying.				
24.	I wish I could be as happy as others seem to be.				
25.	I am losing out on things because I can't make up my mind soon enough.				
26.	I feel rested.				
27.	I am "calm, cool, and "collected".				
28.	I feel that difficulties are piling up so that I cannot overcome them.				
29.	I worry too much over something that really doesn't matter.				
30.	I am happy.				
31.	I am inclined to take things hard.				
32.	I lack self-confidence.				
33.	I feel secure.				
34.	I try to avoid facing a crisis or difficulty.				
35.	I feel blue.				
36.	I am content.				

	Not At All	Somewhat	Moderately So	Very Much So
37. Some unimportant thought runs through my mind and bothers me.	_____	_____	_____	_____
38. I take disappointments so keenly I can't put them out of my mind.	_____	_____	_____	_____
39. I am a steady person.	_____	_____	_____	_____
40. I get in a state of tension or turmoil as I think over my recent concerns and interests.	_____	_____	_____	_____